

The irrationality of categorical perception

Categorical perception is ubiquitous in psychology. The perceptual system often settles on one or other interpretation of an ambiguous stimulus, such as a Necker cube, even when a behavioural response is not required. Such categorization is in direct tension with normative decision theory, which mandates that in the face of uncertainty, the utility of various courses of action should be weighted by the agent's belief in alternate states of the world. If belief is collapsed to a single state, then choices may be suboptimal due to neglecting their costs and benefits under other possible states. We tested for such irrationality in a task that required observers to combine sensory evidence with action-outcome uncertainty. Observers made rapid pointing movements to targets on a touch screen, with rewards determined jointly by uncertainty in stimulus identities and movement endpoints. Across both visual and auditory decision tasks, observers consistently placed more weight on sensory evidence than action consequences. This asymmetry was accounted for by a model in which an internal evidence threshold led to categorical perception on a subset of trials, thus precluding sensitivity to utilities associated with the alternate perceptual state. Our findings indicate that normative decision-making may be fundamentally constrained by the architecture of the perceptual system.